ZOOLOGICAL SCIENCE 5: 1089–1093 (1988)

A Ghost Shrimp with Four-Articulate Fifth Pereopods (Crustacea: Caprellidea: Phtisicidae) from Northwest Australia

AKIRA HIRAYAMA

Biological Laboratory, Department of Liberal Arts, Asia University, 5-24-10 Sakai, Musashino-shi, Tokyo 180, Japan

ABSTRACT—*Quadrisegmentum triangulum* gen. et sp. nov. was found in a gorgonian host, *Isis hippurus*, on Ashmore Reef, Northwest Australia. The new genus is unique in the subfamily Phtisicinae in having four-articulate fifth pereopods. Genera having six-, five- and three-articulate fifth pereopods were previously known in this subfamily. Generic relationships within the Phtisicinae are discussed.

INTRODUCTION

The specimens reported herein were collected by H. K. Larson from a gorgonian host, *Isis hippurus* Linnaeus, on Ashmore Reef in Northwest Australia on 24 July 1986 and were sent to me for identification by A. J. Bruce. They are members of the subfamily Phtisicinae on the basis of the 3–4 fully segmented pereopods [1, 2] but do not fit any definition of the known genera in terms of the numbers of segments in pereopod 5. The new ghost shrimp is 4-articulate, while the known genera of this subfamily are 6-, 5- and 3-articulate [1–6]. These characters are important to the construction of a phylogeny in the subfamily Phtisicinae because they show successional changes in the segmentation of pereopod 5. The new ghost shrimp is described and generic relationships within the subfamily Phtisicinae are discussed on the basis of these characters and other generic ones.

All the specimens described herein are deposited in the collection of the Museum and Arts Galleries of the Northern Territory, Darwin, Australia.

Quadrisegmentum gen. nov.

Diagnosis

Flagellum of antenna 2, 7-articulate in male and 5-articulate in female. Mandibles lacking molar process, provided with 3-articulate palp. Inner and outer plates of maxilliped subequal in size. Gills present on pereonites 2–4, small. Pleonal appendages 2-paired, 2-articulate. Pereopods 3–4, 6-articulate; pereopod 5, 4-articulate.

Type species. *Quadrisegmentum triangulum* sp. nov.

Etymology. The generic name refers to the four-articulate fifth pereopods. The gender is neuter.

Remarks

The new genus apparently belongs to the subfamily Phtisicinae Vasilenko, 1968 [1, 2, 8] with the following diagnostic characters: Gills present on pereonites 2–4; mandibles lacking molar, furnished with 3-articulate palp; pereonites 3–4, 6-articulate. However, it may be clearly distinguished from other genera within this subfamily by unique segmentation of pereopod 5; it is 4-articulate in the new genus and 6-, 5- and 3-articulate in the known genera.

Within the subfamily Phtisicinae, two-paired and bi-articulate pleonal appendages suggest that the new genus is related to six genera: *Paraproto* Mayer, 1903 [3], *Pseudoprotomima* McCain, 1969 [5], *Phtisica* Slabber, 1769 [3, 4, 8], *Protomima* Mayer, 1903 [3, 7], *Protoplesius* Mayer, 1903 [3] and *Chaka* Criffiths, 1974 [6]. All these genera, including *Quadrisegmentum* gen. nov., can be divided into four groups based on the segmentation

Accepted February 22, 1988
Received July 8, 1987

of pereopod 5: 1) 6-articulate group (*Paraproto*, *Pseudoprotomima*), 2) 5-articulate group (*Phtisica*, *Protomima*, *Protoplesius*), 3) 4-articulate group (*Quadrisegmentum* gen. nov.) and 4) 3-articulate group (*Chaka*). These groups suggest an evolutionary change in the phylogeny of the subfamily Phtisicinae, i.e., the 6-articulate fifth pereopods evolved to 3-articulate through 5-articulate and 4-articulate fifth pereopods. Other generic characters listed to date [1–8] do not indicate successional or phylogenic relationships within this subfamily. For example, the setal formula on the terminal segment of the mandibular palp is 1–x–1, where x indicates the number of short setae held between longer setae at both ends of a setal row. The x, however, shows irregular variations at the generic and specific levels [3–8]. Further, the segmentation number of the flagellum of antenna 2 is irregularly variable in the six genera: 14-articulate (males) and 10-articulate (female) in *Paraproto*, 7-articulate (males) and 5-articulate (females) in *Quadrisegmentum* gen. nov., 2 to 5-articulate in *Phtisica*, 2-articulate (males) and 5-articulate (females) in *Protoplesius*, 4-articulate in *Pseudoproto* and *Protomima*, and 3-articulate in *Chaka*. Although the evolutionary tendency of the flagellum segmentation generally shows a reduction in the caprellid amphipods [4, 7, 8], this phenomenon can not be observed in the subfamily Phtiscinae. Therefore, I present the phylogenic assumption that the genera in the subfamily Phtisicinae have evolved from the group with the 6-artiulate fifth pereopods to the group with the 3-articulate ones through the groups with 5- and 4-articulate fifth pereopods and that the new genus *Quadrisegmentum* is at an intermediate state on the evolutionary line.

Quadrisegmentum triangulum sp. nov.
(Figs. 1–3)

Description of the male holotype (8.0 mm)

Body Not spinose. Length ratios of pereonites 1–7, 3 : 4 : 5 : 6 : 9 : 8 : 2. Gills present on pereonites 2–4, small. Pleonal appendages 2-paired, 2-articulate, serrate on inner margins.

Antennae Antenna 1: Length ratios of peduncular segments 1–3, 3 : 4 : 5; flagellum 10-articulate, each segment furnished with 1 aesthetasc. Antenna 2: Gland cone of peduncular segment 2 distinct; length ratios of peduncular segments 3–5, 1 : 3 : 3; flagellum consisting of 7 segments, distal one rudimentary.

Mouthparts Upper lip symmetrically bilobate. Lower lip: Mandibular process medium. Maxilla 1: Outer plate provided with 6 tooth-like spines; palp consisting of 2 segments, distal one provided with 4 teeth, 1 apical spine and 3 setae on distal half of outer side. Maxilla 2: Both plates provided with 5 apical setae. Mandibles similar to each other; incisor provided with 4 large teeth; lacinia

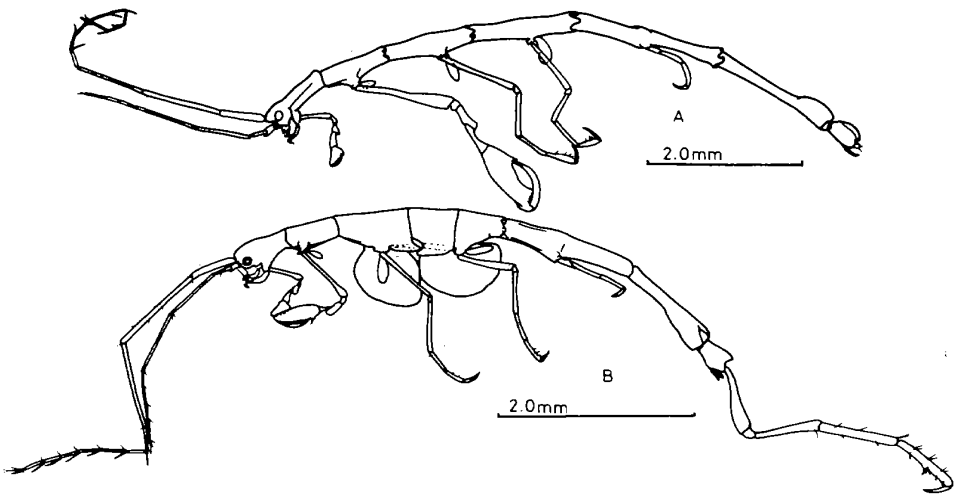

FIG. 1. *Quadrisegmentum triangulum* gen. et sp. nov. A: Holotype, male, 8.0 mm. B: Paratype (no. 2), female, 5.2 mm.

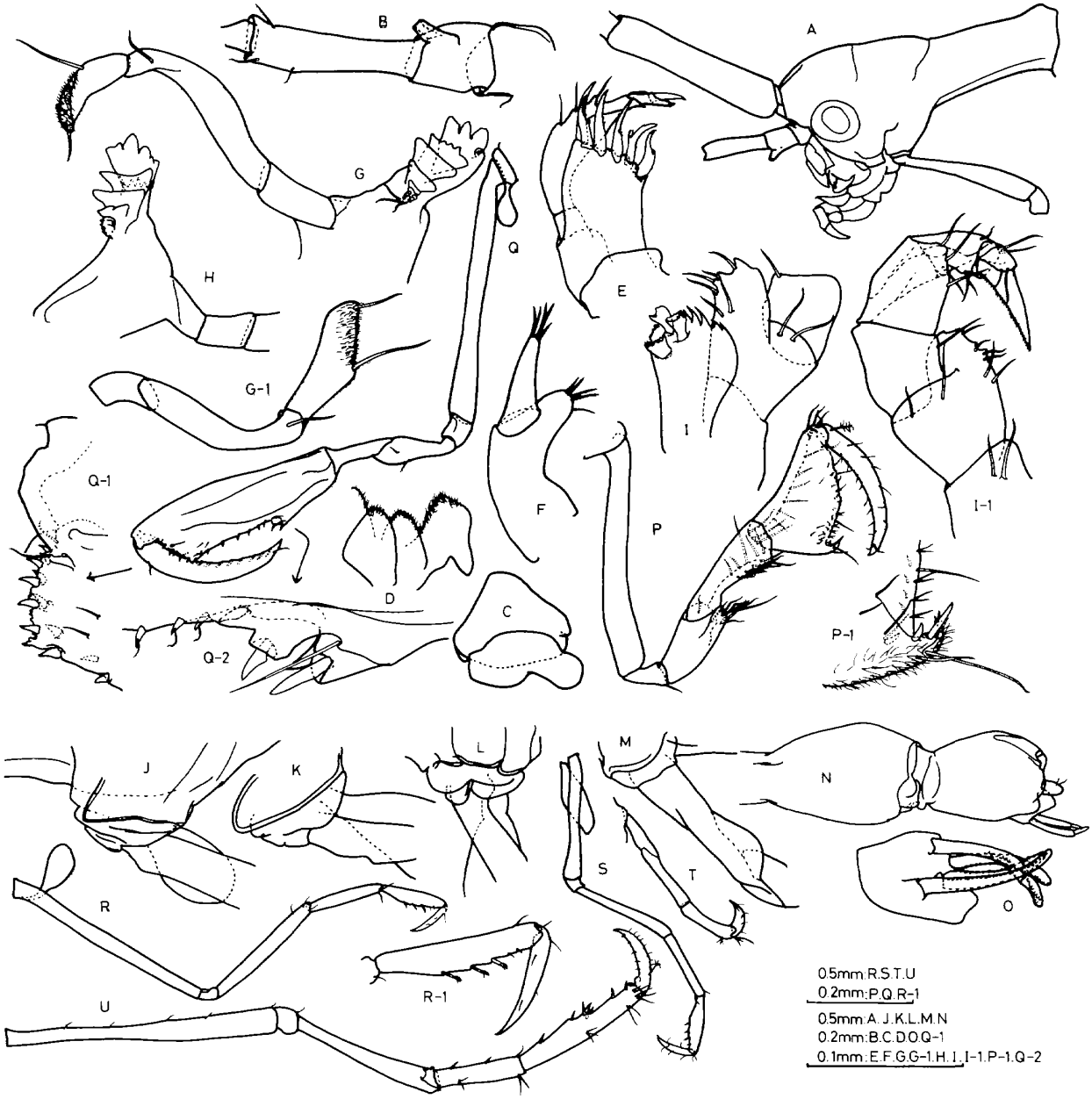

FIG. 2. *Quadrisegmentum triangulum* gen. et sp. nov., male holotype. A: Head. B: Peduncle of antenna 2. C: Upper lip. D: Lower lip. E: Maxilla 1. F: Maxilla 2. G: Left mandible. G-1: Palp of left mandible. H: Right mandible. I: Inner and outer plates of maxilliped. I-1: Outer plate and palp of maxilliped. J: Coxa 2. K: Coxa 3. L: Coxa 4. M: Coxa 5. N: Pereonites 6–7. O: Pleonal appendages. P: Gnathopod 1. P-1: Palmar cusp of gnathopod 1. Q: Gnathopod 2. Q–1 and Q–2: Palm of gnathopod 2. R: Pereopod 3. R-1: Propod and dactyl of pereopod 3. S: Pereoped 4. T: Pereoped 5. U: Pereopod 6.

mobilis consisting of 3 large and several small plates; accessory setae 3 in number; palp consisting of 3 segments, of which middle one is furnished with 1 distal seta, terminal segment of palp pubescent and bearing 2 setae on distal half. Maxiliped: Inner plate serrate distally, armed with 3 apically serrate spines; outer plate subequal to inner plate in size, provided with 6 inner marginal setae; palp consisting of 4 segments, of which the penultimate one is prominently protruded distolaterally.

Coxae Coxae 1–5 coalescent with pereonites, vestigial; coxae 6–7 absent.

Gnathopods 1–2 Gnathopod 1: Length ratios of segments from basis to propod approximately 16 : 3 : 7 : 9 : 10; carpus compressed at 1/3 from proximal end; propod triangular; palm defined by

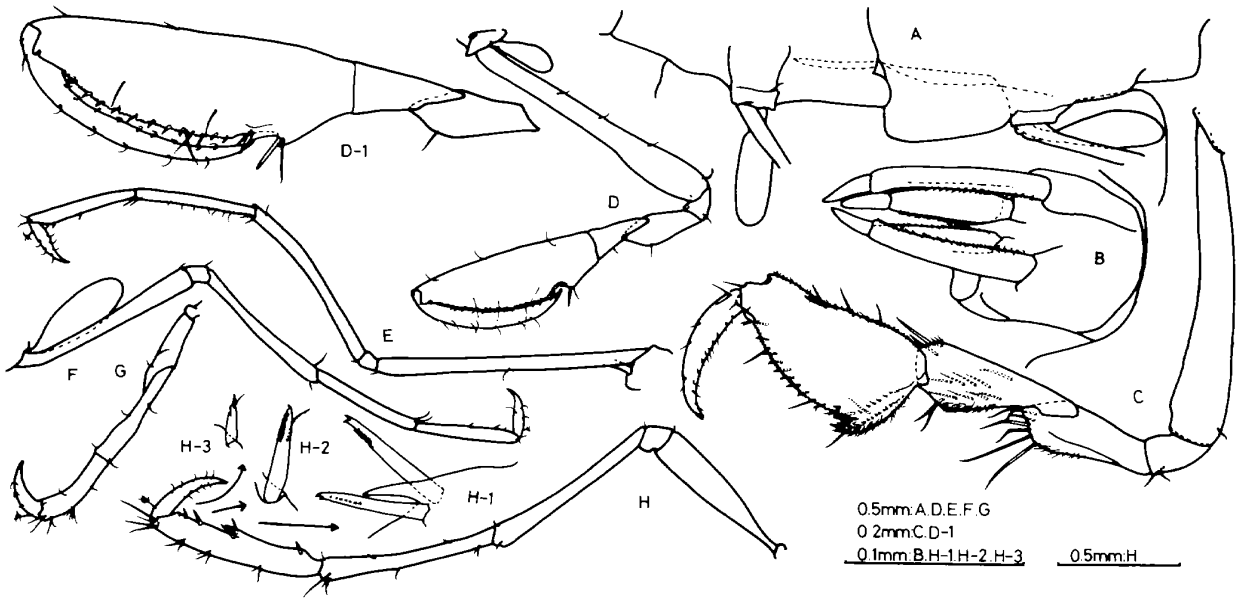

FIG. 3. *Quadrisegmentum triangulum* gen. et sp. nov., female paratype (no. 2). A: Ventrolateral part of pleonites 3–4. B: Pleonal appendages. C: Gnathopod 1. D: Gnathopod 2. D-1: Merus, Carpus, propod and dactyl of gnathopod 2. E: Pereopod 3. F: Pereopod 4. G: Pereopod 5. H: Pereopod 7. H-1, H-2 and H-3: Spines on propod of pereopod 7.

prominent, curved, bifid process with 2 accompanying spines; dactyl reaching cusp when closed. Gnathopod 2 slender, feeble on segments from basis to carpus; length ratios of segments from basis to propod approximately 9 : 1 : 3 : 2 : 7; merus and carpus not prominently overlapping each other; propod quadrangular; palm extending on more than half of posterior margin of propod, truncate and serrate distally, defined by both palmar and poison projections, each of them armed with 1 spine; dactyl reaching palmar protrusion when closed, provided with numerous pits on grasping margin.

Pereopods 3–7 Pereopods 3–4: 6-articulate, slender, feeble; pereopod 3, 0.78 as long as pereopod 4; length ratios of segments from basis to dactyl approximately 9 : 1 : 7 : 5 : 4 : 3 in pereopod 3, 15 : 1 : 9 : 5 : 5 : 3 in pereopod 4; propod slightly dilated at 3/7 from proximal end, bearing 4 spines on distal 4/7 of inner margin, distal spine of them small. Pereopod 5: 4-articulate, slender; length ratios of segments 1–4, 4 : 5 : 4 : 2; propod uniform in width; dactyl falcate. Pereopod 6: 6-articulate, slender; length ratios of segments from basis to dactyl approximately 14 : 1 : 7 : 4 : 7 : 3; propod provided with inner medial tooth bearing 2 paired spines basally, also with 4 inner spines in addition to these two paired spines; dactyl falcate. Pereopod 7 missing.

Description of female paratype (no. 2, 5.2 mm)

Antenna 2: Flagellum consisting of 4 segments and a rudimentary one. Gnathopod 1 similar to that of female. Gnathopod 2: Length ratios of segments from basis to propod 16 : 2 : 5 : 4 : 11; merus and carpus obliquely articulate; segmentation scar visible between carpus and propod; propod semilunar; palm defined by palmar protrusion, which is amred with 1 spine, slightly rounded, finely serrate from proximal 2/3 point to distal end of itself; poison tooth present near palmar spine, amred with 2 paired spines; dactyl reaching poison tooth when closed. Pereopods 3–4: Propod not dilated, provided with 3 small spines; dactyl slightly dilated proximally. Pereopod 5 similar to that of male. Pereopod 6 missing. Pereopod 7: Merus, carpus and propod equal in length, slightly longer than basis; carpus provided with 2 spines; propod with 1 medial tooth bearing 2 paired spines basally, also with 1 proximal and 2 distal spines; dactyl falcate, reaching opposite proposal tooth when closed.

Material examined

Holotype: Male, 8.0 mm, taken from gorgonian host, *Isis hippurus* Linnaeus, in 18 m on west islet of Ashmore Reef, Northwest Australia (12°14.28′S., 122°59.14′E.); 24 July 1986; coll. H. K. Larson. Paratypes: One male (no. 1) and two females (nos. 2–3), collected with the holotype. Holotype and paratype no. 2 are mounted on slide glasses in a gum-chloral medium. Collection number: NTM Cr. 00447.

Etymology The specific name, *triangulum*, is derived from the triangular propod of gnathopod 1.

ACKNOWLEDGMENTS

I wish to thank Drs. H. K. Larson and A. J. Bruce of the Northern Territory Museum of Arts and Sciences, Australia, for giving me the opportunity to examine the present materials. Thanks are also due to Dr. Yoshihide Suzuki of Asia University for providing me with working space and facilities.

REFERENCES

1 Vasilenko, S. V. (1968) On the question of systematics and the basic line of development in the family Caprellidae. Doklady Akademija Nauk USSR, **183**: 1461–1464. (In Russian)

2 McCain, J. C. (1968) Familial taxa within the Caprellidea (Crustacea: Amphipoda). Proc. Biol. Soc. Wash., **82**: 837–842.

3 Mayer, P. (1903) Die Caprellidae der Siboga-Expedition. Siboga Exped., **34**: 1–160, pls. 1–10.

4 McCain, J. C. (1968) The Caprellidae (Crustacea: Amphipoda) of the western North Atlantic. Bull. U. S. Nat. Mus., **278**: 1–147.

5 McCain, J. C. (1969) New Zealand Caprellidae (Crustacea: Amphipoda). N. Z. J. Mar. Freshwat. Res., **3**: 286–295.

6 Griffiths, C. L. (1974) The Amphipoda of Southern Africa. Part 3. The Gammaridea and Caprellidea of Natal. Ann. S. Afr. Mus., **62**: 209–264.

7 Arimoto, I. (1976) Taxonomic studies of caprellids (Crutacea, Amphipoda, Caprellidae) found in the Japanese and adjacent waters. Spec. Publ. Seto Mar. Biol. Lab., **3**: 1–299.

8 Vasilenko, S. V. (1974) Caprellids of the sea of the USSR and adjacent waters. Akademija Nauk USSR, **107**: 1–288. (In Russian)